

REMARKS

Favorable reconsideration of this application in view of the remarks to follow is respectfully requested.

Before addressing the specific grounds of rejection raised in the outstanding Office Action, Applicants have amended Claims 21 and 32 in the manner indicated supra.

Specifically, Claim 21 has been amended to positively recite that a first portion of a bottom surface of said first trench isolation region does not contact any nitride liner. Support for this amendment is found in FIGS. 5B and 5C and paragraphs [0067] and [0068] of the originally filed application. Particularly, each of the trench isolation regions filled with a trench dielectric material has a portion, which is herein referred to as “a first portion,” that does not contact any nitride liner and another portion that contacts a nitride liner. Applicants note that such a feature is an inherent consequence of the pattern in the block mask 75 and the processing methods employed in the instant application.

Further, Claim 21 has been amended to positively recite a nitride liner laterally abutting a second portion of the first trench isolation region, wherein the second portion laterally abuts the first portion, wherein an edge of the nitride liner is located at a bottom surface of the first trench isolation region underneath a boundary between the first portion and the second portion. Support for this amendment is found in FIGS. 5B and 5C and paragraphs [0067] and [0068] of the originally filed application. As discussed above, each of the trench isolation regions filled with the trench dielectric material has a first portion that does not contact any nitride liner and another portion, which is herein referred to as “a second portion,” that contacts a nitride liner. Since the first portion and the second portion are of integral construction and together form one of the trench isolation regions, the first portion and the second portion laterally abut each other

naturally. In addition, an edge of the nitride liner is located at a bottom surface of the first trench isolation region underneath a boundary between the first portion and the second portion as a consequence. Applicants note that such features are also inherent consequences of the pattern in the block mask 75 and processing methods employed in the present application.

Yet further, Claim 21 has been amended to positively recite that another edge of the nitride liner is located at a bottom surface of the second trench isolation region. Support for this amendment is found in FIGS. 5B and 5C and paragraphs [0067] and [0068] of the originally filed application. As discussed above, each of the trench isolation regions filled with the trench dielectric material has a portion that does not contact any nitride liner and another portion that contacts a nitride liner. Such a feature is also an inherent consequence of the pattern in the block mask 75 and processing methods of the present application.

Claim 32 has been amended to positively recite that an edge of the nitride liner is located at a bottom surface of the trench isolation region. Support for this amendment is found in FIGS. 5B and 5C and paragraphs [0067] and [0068] of the originally filed application.

Claims 41 and 42 have been added. Claim 41 positively recites all claim limitations of Claim 32 prior to the present amendment. In addition, Claim 41 positively recites that the nitride liner abuts a semiconductor material of the first semiconductor active area. Support for this amendment is found in FIGS. 5B and 5C and paragraphs [0067] and [0068] of the originally filed application. Particularly, FIGS. 5B and 5C of the originally filed application clearly shows that any sidewall that abuts a nitride liner on one side necessarily abuts a semiconductor material of a semiconductor active area on the other side.

Claim 42 is supported by Claim 33 of the instant application.

Since all of the amendments are supported by the specification, entry thereof is respectfully requested.

In the outstanding Office Action, Claims 21 – 27, 29 – 37, and 39 and 40 stand rejected under 35 U.S.C. §103(a) as alleged obvious over the combined disclosures of U.S. Patent No. 6,348,394 to Mandelman et al., (hereinafter “Mandelman”), U.S. Patent Application Publication No. 2004/0155275 to Divakaruni et al., (hereinafter “Divakaruni”), U.S. Patent No. 6,156,620 to Puchner et al., (hereinafter “Puchner”), and EPA Published Application No. 1,213,757 to Oh et al., (hereinafter “Oh”).¹

In the outstanding Office Action, the Examiner alleged that Oh teaches the inventive structure of the present invention whereby a nitride liner is used to line some isolation sidewall and not on other sidewalls. The Examiner further alleged that the cited references taken together teach the claimed features of the present invention.

In response to the Examiner’s rejection of Claims 21 – 27, 29 – 37, and 39 and 40 under 35 U.S.C. §103(a), Applicants submit that currently amended Claims 21 and 32 and the dependent claims therefrom are not rendered obvious by the combined disclosures of applied references.

Applicants respectfully submit that the structures of the present application, as recited in currently amended Claims 21 and 32 and the dependent claims therefrom, are not rendered obvious by the combined disclosures of Mandelman, Divakaruni, Puchner, and Oh. Specifically, none of the applied prior art references teaches or suggests a semiconductor structure in which an edge of a nitride liner is located at a bottom surface of a trench isolation region.

¹ The Examiner acknowledged that the declaration filed on October 25, 2007 under 37 C.F.R. 1.131 is sufficient to overcome the prior reference, U.S. Patent Application Publication No. 2004/0212035 to Yeo et al.

As discussed in Applicants' prior responses, none of Mandelman, Divakaruni, and Puchner teaches or suggests the coexistence of a first trench isolation region laterally abutting a first sidewall of a first semiconductor active area, wherein the first sidewall does not contact any nitride liner AND a second trench isolation region laterally abutting a nitride liner, which laterally abuts a second sidewall of a second semiconductor active area as recited in Claim 21 of the instant application. Further, none of the Mandelman, Divakaruni, and Puchner teaches or suggests the coexistence of a first sidewall that adjoins a trench isolation region, in which a first sidewall of a first semiconductor active area that laterally abuts the trench isolation region and does not contact any nitride liner AND a nitride liner laterally abutting a second sidewall of a second semiconductor active area and the trench isolation region as recited in Claim 32 of the instant application.

All sidewalls of a trench isolation region in Mandelman, Divakaruni, and Puchner have the same composition. In order to have different compositions on different sidewalls of one or multiple trench isolation region(s), it is necessary to differentiate sidewalls during processing as the present invention does. None of Mandelman, Divakaruni, and Puchner provides such a mechanism, and therefore, the applied references are incapable of producing a structure having two different compositions for different sidewalls of (a) trench isolation region(s).

Among the references cited in the outstanding rejection, Applicants submit that Oh is the only reference that teaches or suggests two types of shallow trench isolation (STI) structures. A nitride liner is present in one STI structure, and a nitride liner is absent in another STI structure. However, paragraph [0026] of Oh discloses that "[t]he relief liner 110 on the core and peripheral regions A2 is removed so that the sidewall oxide layer 108 is free of the relief liner 110 thereupon." Oh further discloses that "[t]he first trench 106a is formed in the cell region A1

which may be densely populated with device” and that “the width of the first trench 106a may be less than the width of the second trench 106b that is formed in the core and peripheral regions A2” (paragraph [0023] of Oh). Applicants observe that the cell region A1 and the core and peripheral regions are two distinct regions. Oh further discloses that “a photoresist pattern 112 is formed on the cell region using a known photolithography process” and that “[t]he core and peripheral regions A2 are exposed” (paragraph [0026] of Oh) during the patterning of the relief liner 110.

The disclosure of Oh, as manifested in the specification and FIG. 3C, clearly shows that the edge of the relief liner 110 in Oh is necessarily located over a pad layer, which is referred to as a silicon nitride layer 104 in Oh, which is present over any trench or any trench isolation region. Thus, there is no teaching or suggestion in Oh for a semiconductor structure in which an edge of a nitride liner is located at a bottom surface of a trench isolation region.

In contrast, the semiconductor structure disclosed and claimed in the instant application positively recites a nitride liner in which an edge of a nitride liner is located at a bottom surface of a trench isolation region.

The §103 rejection also fails because there is no motivation in the applied references, either individually or in practicable combinations, which suggests modifying the disclosed structures to include the various elements recited in the claims of the present invention. There is no motivation provided in the applied references, or otherwise of record, to make the modification mentioned above since the combination of Mandelman, Divakaruni, and Puchner does not provide any semiconductor structure having different structures for sidewalls of a trench isolation structure, let alone a nitride liner in which an edge of a nitride liner is located at a bottom surface of a trench isolation region. Oh does not provide any motivation to form an edge

of a nitride liner at a bottom surface of a trench isolation region since any such edge is formed above and outside trenches. Not only is there a complete lack of a teaching or suggestion for forming an edge of a nitride liner located at a bottom surface of a trench isolation region in Oh, but even if such an attempt were to be conceived as a variation of the structure disclosed in Oh, such a structure would only undermine the benefits that Oh intends to accomplish since the purpose of a relief nitride is to provide relief in mechanical stress only on one side, while not providing relief on the opposite side. Thus, Oh does not provide any motivation for, and would in fact discourage, a modification that might result in a structure similar to the structure claimed in the instant application.

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Vaeck, 947 F.2d, 488, 493, 20 USPQ 2d. 1438, 1442 (Fed.Cir. 1991).

In view of the above remarks, the rejection under 35 U.S.C. §103 has been obviated; therefore reconsideration and withdrawal thereof is respectfully requested.

After reviewing the references that the Examiner cited in the prior rejections, Applicants observe that new Claims 41 and 42 are not taught or suggested in any of the applied references, singularly or in any combination. Applicants submit that new Claims 41 and 42 are thus patentable.

Particularly, Applicants submit that any nitride liner disclosed in Oh, specifically the relief liner 110, does not abut any semiconductor material since the nitride liner is separated from the semiconductor material of the semiconductor substrate. This is illustrated in FIG. 3E of Oh in which the relief liner 110 is separated from the semiconductor substrate by a sidewall oxide layer 108 (See paragraph [0024] of Oh).

Further, the combination of Mandelman, Divakaruni, and Puchner does not provide any semiconductor structure in which one sidewall of a semiconductor active area abuts a nitride liner and another sidewall of another semiconductor active area does not abut any nitride liner.

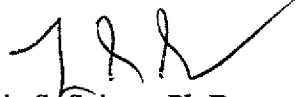
In contrast, FIGS. 5B and 5C of the instant application clearly show that a nitride liner laterally abutting a sidewall and a trench isolation region also abutting a semiconductor material of a semiconductor active area.

Therefore, Applicants submit that Claims 41 and 42 are patentable.

Applicants submit that all of the pending claims are patentable. Accordingly, prompt examination and allowance thereof is respectfully requested.

Should the Examiner determine that anything further is desirable to place this application in even better form for allowance, the Examiner is invited to contact the undersigned at the telephone number indicated below.

Respectfully submitted,



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